

THE BIOLOGY OF THE LEECH *MYZOBDELLA LUGUBRIS* INFESTING BLUE CRABS AND CATFISH

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A cyclic seasonal abundance for fish leeches has been reported by Gibson and Tong (1969) and Sawyer and Hammond (1973). Fish leeches leave their hosts to deposit cocoons on rocks (Becker and Katz, 1965), oyster clumps, and other suitable surfaces (Sawyer and Hammond, 1973). From the present work it appears that the piscicolid *Myzobdella lugubris* is parasitic on a piscine host for most of the year and then leaves the fish and deposits cocoons on decapods. This is the first record of a fish leech utilizing both a fish and an arthropod in its life history.

Myzobdella lugubris Leidy 1851 and *Illinobdella moorei* Meyer 1940 have until recently been separated primarily on the basis of salinity and host. *Myzobdella lugubris* was known as a marine leech commensal on crustaceans (Hutton and Sogandares-Bernal, 1959; Pearse; 1936; Sawyer, 1967; Wurtz and Roback, 1955), and *Illinobdella moorei* as a freshwater leech parasitic on fishes (Hoffman, 1967). Sawyer, Lawler and Overstreet (1974) have recently synonymized these two forms with *M. lugubris* taking precedence. The ecological data presented in this paper supports such a synonymy.

MATERIALS AND METHODS

To establish the seasonal abundance of *M. lugubris*, a population was examined at monthly intervals from May, 1972 through April, 1973 in the middle reaches of the Ashley River, Dorchester county, South Carolina (32°55.5'N; 80°08.0'W). Here *M. lugubris* was parasitic in large numbers on the common white catfish, *Ictalurus catus* (Linnaeus). The Ashley River is tidal along most of its length (salinity from 0 to 14‰). The temperature varied from 4° C in January to 29° C in July. The river was exceptionally turbid with a typical Secchi disc reading of 75 cm (range 20 to 125 cm). The bottom and banks of the river consisted primarily of sand and *Spartina* detritus. Very few stones or rocks were present.

The numbers of catfish collected during each monthly sample ranged from 39 to 141. All catfish were captured with a 4.5 m trynet with 0.5 cm square mesh.

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Hosts were isolated in plastic bags and placed on ice. In the laboratory the numbers and positions of the leeches on each fish were recorded. Leeches not kept for biological observations were anesthetized by slowly adding small amounts of 90% ethanol and then preserved in 10% formalin.

Specimens and cocoons from this study are deposited in the U. S. National Museum (USNM 49962).

RESULTS

Of the 868 catfish examined 70% were infested with leeches. The average number of leeches per catfish was 2.7 with 1.2 (44%) on the pectoral fins, 0.4 (15%) on the pelvic fins, 0.4 (15%) in the mouth, and the remaining 0.7 (26%) distributed over the rest of the body. The seasonal abundance of *M. lugubris* can be divided into three phases: May through September, during which the population remained relatively stable; October through January, when recruitment to the population occurred; and February through April, when the population underwent a decline (Table I).

TABLE I
Monthly infestation of Myzobdella lugubris on I. catus.

Date	Temperature °C	Number of fish examined	Number of fish infested	Number of leeches, fish	
				Range	Mean \pm 2 S.E.
V/24/72	22.2	67	33	0-12	1.1 \pm 0.2
VI/30/72	26.4	77	28	0-6	0.7 \pm 0.2
VII/23/72	29.7	42	0		
VIII/8/72	28.2	45	20	0-2	0.7 \pm 0.1
IX/8/72	25.6	141	71	0-4	0.8 \pm 0.1
X/7/72	22.0	89	72	0-10	2.3 \pm 0.2
X/22/72	17.5	90	78	0-11	3.0 \pm 0.3
XI/7/72	18.5	72	68	0-14	3.9 \pm 0.3
XII/9/72	13.7	72	58	0-18	3.8 \pm 0.4
I/13/73	4.5	66	65	0-48	11.4 \pm 1.4
III/18/73	16.9	63	50	0-9	2.4 \pm 0.3
IV/21/73	22.6	39	28	0-10	2.4 \pm 0.4

Two apparent anomalies existed in the relative abundance of leeches on different parts of the catfish. On 22 October 44% of the leeches were found in the mouth compared with less than 15% for the rest of the year. In January and March 24% and 31% respectively of the leeches occurred on the barbels compared with less than 5% for the rest of the year.

The seasonality was further corroborated by a strong negative correlation between water temperature and the average number of leeches per catfish ($r = -0.92$) as well as between the temperature and the catfish infestation rate ($r = -0.81$).

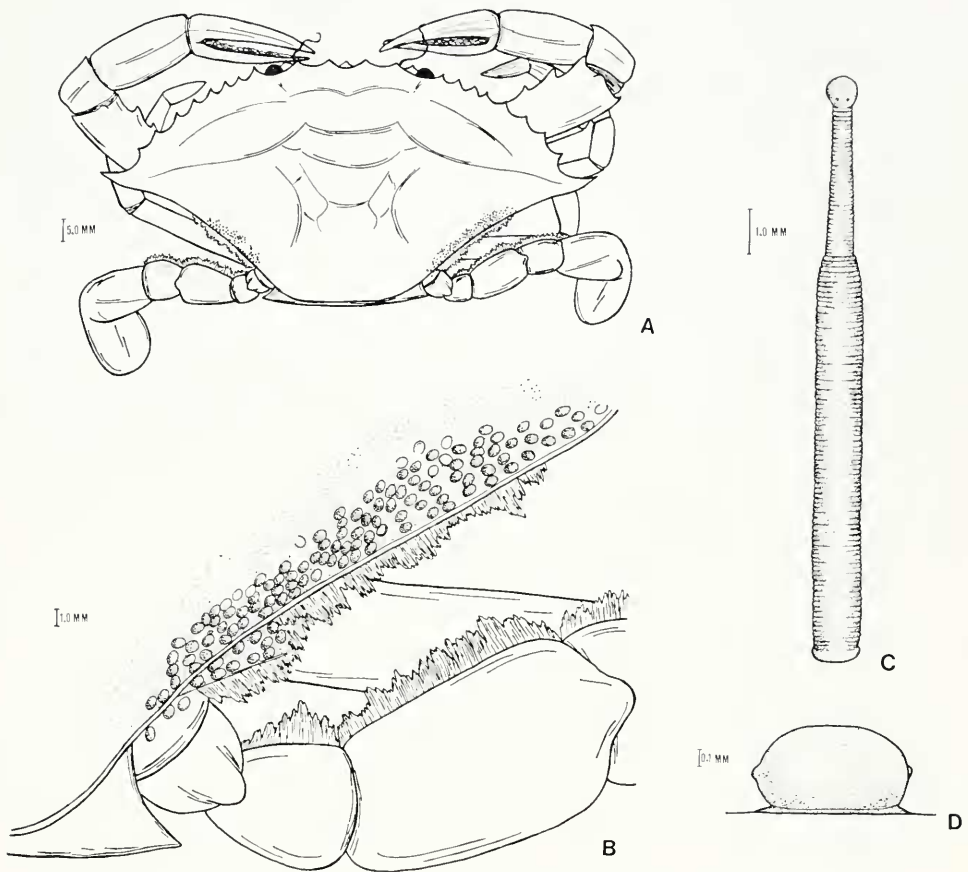


FIGURE 1. Cocoons of *Myzobdella lugubris* on the carapace of *Callinectes sapidus*: A, *Callinectes sapidus* with cocoons on the postero-lateral regions; B, enlargement of the same postero-lateral region; C, *Myzobdella lugubris*, dorsal view; D, cocoon of *Myzobdella lugubris*. All were drawn from specimens by Ann F. Flowers.

For most of the year the leeches were randomly distributed on the fish population (the variance equal to the mean) but in January the leech distribution was overdispersed (mean much greater than variance).

Throughout the year, especially in October and November, leeches were encountered on the carapace of the blue crab. Upon close examination it became evident that the crab carapace normally served as a site for the deposition of the leech cocoons (Fig. 1).

In a sample of 28 crabs collected on 7 October 1972 in the lower reaches of the Ashley River, 18 crabs with an average of 118 cocoons (range 1-294) had a total of 2123 cocoons. The cocoons were deposited on the postero-lateral regions of the

carapace, equally distributed dorsally and ventrally and without regard to sex. Some of the crabs had engorged leeches the guts of which contained nucleated erythrocytes.

Based on one year's data it is suggested that the population of *M. lugubris* on *Ictalurus catus* in the Ashley River undergoes an annual cycle. The number of leeches on the catfish declines in the spring, and increases in the fall. Associated with this fall increase is an increase in the percentage of the population occurring in the mouth. It is apparently here that the leeches become engorged with blood before leaving the catfish to deposit cocoons.

The peak of cocoon deposition occurs during the summer months. However, crabs with cocoons were found in the Ashley River from the last of March until November. No crabs were found in the area sampled during the rest of the year. In the laboratory cocoons hatch in 11–39 days at 23–25° C (Sawyer *et al.*, 1974). It is not known, however, how long it takes the cocoons to hatch at other temperatures. Shortly after the young leeches attach to their host they take their first blood meal and this is followed by a period of rapid growth. A gradual decline in the leech population occurred between January and July.

DISCUSSION

Myzobdella lugubris is the first documented case of a piscicolid leech whose life cycle may normally involve two "hosts," one fish and one crustacean. Similar leeches, *e.g.*, *Crangonobdella murmanica*, *Glyptonotobdella antarctica*, and *Hemibdella solcae*, are known only from crustacean or fish hosts, never from both (Selensky, 1914, 1915; Llewellyn, 1965; Sawyer and White, 1969). Only three other instances have been fully documented in which piscicolids use arthropods as sites for cocoon deposition. *Crangonobdella murmanica* deposits cocoons on the shrimp *Scudocrangon borcas* (see Selensky, 1914, 1915; MacGinitie, 1955), *Johanssonia pantopodum* deposits cocoons on the pycnogonid *Nymphon stromi* (see Selensky, 1914, 1915), and *Notostomobdella cyclostoma* deposits cocoons on the crab *Paralithodes camtschaticus* (see Moore and Meyer, 1951). About ten other leeches have been reported on arthropods by various authors, and in more than one case the leeches were thought to parasitize the hosts (Selensky, 1914, 1915; Meyer and Barden, 1955; Sawyer and White, 1969). In spite of these brief reports to the contrary, a case for a piscicolid feeding on an arthropod has never been unequivocally documented. It is more likely that leeches employ arthropods only for locomotion and/or cocoon deposition.

Myzobdella lugubris (= *Illinobdella moorei*) has been found in fresh and brackish water over most of the United States and reported from over two dozen fish species with what appears to be little host preference (Sawyer *et al.*, 1974). Little biological work has been done on the freshwater form, and its life history where crabs and shrimp are absent is not certain. Whether freshwater *Myzobdella*

lugubris normally utilize stones or other abiotic substrates for cocoon deposition is yet to be answered.

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SUMMARY

1. The life history of *Myzobdella lugubris* is described based upon a quantitative study of the leech from white catfish, *Ictalurus catus*, and blue crabs, *Callinectes sapidus*, from the estuaries of Charleston, South Carolina.
2. The leech displayed seasonality on the fish which inversely correlated with water temperature.
3. The greatest increase in the leech population occurred during December.

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